

## APPENDIX A

### METHODOLOGY OF CONSTRUCTING EFFECTIVE EXCHANGE RATE INDICES

#### General Approach

Exchange rates are expressed as the foreign price of domestic currency, so that a rise (fall) implies an appreciation (depreciation) of the respective series. All indices are set to 1913=100. In light of the conventional practice of constructing aggregate price indices, we use geometric weights to derive the effective exchange rate as a weighted average of the bilateral rates with the various trading partners.

For each country, nominal and real indices are calculated over the same set of trading partners to ensure consistency between the two series.<sup>1</sup> While the number of trading partners varies from country to country depending on data availability, in no case is the coverage less than two thirds of total merchandise trade. Among the choice of deflators, preference was given to GDP deflators (whenever available) or consumer price/cost of living indices, relative to wholesale price series.<sup>2</sup>

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<sup>1</sup> This consistency is particularly important for the type of variance decomposition exercises carried out in Section III of the main text.

<sup>2</sup> A detailed discussion of the equivalences as well as trade-offs between the different real exchange rate measures, and of the rationale for using GDP deflators- or consumer price index-based measures, is provided in Leslie Lipschitz and Donogh McDonald, 1991, "Real Exchange Rates and Competitiveness: A Theoretical and Empirical Assessment," IMF Working Paper 91/25.

## Silver Standard Countries

### CHINA

China operated a silver standard throughout the period 1870-1913. Although a large number of subsidiary provincial currencies existed, in addition to the Tael, these were not used in foreign exchange transactions. Nominal effective exchange rates (NEERs) have been calculated using bilateral trade weights for 7 of China's main trading partners, covering approximately 70 per cent of trade.<sup>3</sup> Exchange rate indices were constructed using trade weights for 1888 and 1905 respectively.<sup>4</sup> A geometric mean was then used to derive the Fisher ideal index over this period. Real effective exchange rate indices have been calculated as weighted averages of nominal bilateral rates adjusted for relative wholesale price changes. The country coverage and the weights are the same as were used in the NEER calculations.

### INDIA

India remained on a silver standard until 1893. In 1893 the Indian mints were not allowed free coinage of silver and the exchange rate was held at 15 rupees to the pound, which put the value of the rupee above its silver bullion content. In 1898 the decision was taken to use the profits of coinage to build up a gold and sterling reserve in London. By 1903 the rupee was operating on a de facto gold-exchange system.<sup>5</sup> NEER's have been calculated using bilateral trade weights for 7 of India's main trading partners, accounting for over 70 per cent of visible trade.<sup>6</sup> Trade weights for 1875 and 1913 respectively were used. A geometric mean was then used to derive the Fisher ideal index over this period. The REER index based on consumer price data is constructed using the same weights (with the exception of China where wholesale prices were used).

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<sup>3</sup> The countries included are UK, USA, France, Germany, Japan, Russia and India. In addition to the direct trade with the UK, we classified  $\frac{3}{4}$  of China's imports from Hong-Kong and  $\frac{9}{14}$  of its exports as going to the UK, consistent with information provided in Yu-Kwei Cheng, 1956, *Foreign Trade and Industrial Development of China*, Washington, University Press of Washington D.C.

<sup>4</sup> For all countries a number of weighting systems were investigated, all displaying very similar movements over time.

<sup>5</sup> We are grateful to Tom Tomlinson for clarifying these details.

<sup>6</sup> The countries are Australia, China, Germany, Japan, Russia, UK and USA.

## **JAPAN**

Japan remained on a silver standard until 1897. The nominal effective exchange rate is calculated as the weighted average for 11 of Japan's main trading partners<sup>7</sup> (accounting for over 70 per cent of Japan's visible trade) using trade weights for 1879 and 1913 respectively. Similarly, the REER index has been calculated as a weighted average of nominal bilateral rates adjusted for relative price changes for the same 11 trading partners. Where possible we used consumer prices as deflators. The exception to this is China where wholesale prices were used. Given the weight of China in Japan's trade (which averaged about 14 per cent during this period) this data constraint has an effect on the magnitude of the annual movements, but the effect should be small.

## **MEXICO**

Mexico operated a silver standard throughout the 19<sup>th</sup> century, joining the gold standard in 1905. For the period 1870–1913 the nominal effective exchange rate is calculated as the weighted average for 5 of Mexico's main trading partners (which account for over 95 per cent of Mexico's visible trade), using trade weights for 1893 and 1910 respectively.<sup>8</sup> A geometric average of the series based on 1893 weights and that based on 1910 weights was used to derive the index used in the paper. The real effective exchange rate has been calculated as a weighted average of nominal bilateral rates adjusted for relative consumer price changes.

## **Inconvertible Paper Standard Countries**

### **ARGENTINA**

Between 1870 and 1899, Argentina was on gold during 1870-75 and between 1883 to March 1885, remaining on an inconvertible paper currency otherwise. The country finally joined the gold

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<sup>7</sup> Australia, Belgium, Canada, China, France, Germany, India, Italy, Netherlands, UK and USA.

<sup>8</sup> The trading partners are France, Germany, Spain, the United Kingdom, and the United States. The year of 1893 was chosen as the first reference point because of limited information on direction of trade from Mexico's national statistics for earlier years. Extending this calculation to 12 trading partners yields very similar results to the 5-country index.

standard on a more long-lasting basis in 1899. Effective exchange rates have been calculated after experimenting with alternative trade weights. Argentina's national data sources report bilateral trade flows in "official" values to 1910.<sup>9</sup> These differ from market values. As part of a sensitivity analysis we experimented with three alternative ways of deriving trade weights. Using other countries' national trade data we were able to derive weights for Brazil, France, Germany, the United Kingdom and United States. Excluding Brazil we can do this for the whole period 1880–1913; including Brazil we can cover the period 1901–1913. The second method is to use Argentina's "official" data. Finally, we derive Brazil's share using the "official" data and we then use the national data for France, Germany, United Kingdom and United States to derive a complete set of weights for the period. In fact all the derived exchange rate series are very similar in both annual variation and trend movements irrespective of which set of weights is used. In terms of data reliability we favor using the weights derived from national data sources. For the period 1870–1913 the NEER is calculated as the weighted average for Argentina's 5 main trading partners based on trade weights for 1895 and 1912 respectively (over this period these 5 countries accounted for approximately 70 per cent of visible trade). A geometric mean was then used to derive the Fisher ideal index over this period. A REER is calculated using consumer prices as deflators, with the exception of Brazil where we have used a GDP deflator.

## **BRAZIL**

Except for a brief interlude between late 1888 and 1889,<sup>10</sup> Brazil operated an inconvertible paper currency over the period 1870–1905. The country joined the gold standard in 1906. Nominal Effective exchange rates have been calculated using bilateral trade weights. Given the dearth of data on bilateral trade flows in Brazil's national data sources before 1900 we derived trade shares using the national trade data from Britain, France, Germany, America and Argentina converted to sterling. These five countries accounted for about 70 per cent of Brazil's exports and 85 per cent of its imports in 1901–13. Comparing the sum of trade accounted by this group with total trade for Brazil, the trade coverage averages 80 per cent of visible trade over the period 1880–1913. For the period 1870–1913

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<sup>9</sup> Brian R. Mitchell, 1998, *International Historical Statistics: The Americas and Australasia*. London, Macmillan.

<sup>10</sup> In October 1888 the Brazilian currency reached its legal gold standard parity (set in 1847) of 27 pence/mil-réis. It remained around that parity (within a 3 percent band) until November 1889.

two NEER indices were calculated as the weighted average for Brazil's 5 main trading partners using 1880 and 1913 weights. A geometric mean was then used to derive the Fisher ideal index over this period. The REER index was constructed using the same weights for the same 5 main trading partners. Since the most comprehensive price index for Brazil is constructed using aggregate production weights, thus resembling a GDP-based index, we have used GDP deflators as price deflators for the trading partners with the exception of Argentina for which we have used the CPI deflator.<sup>11</sup>

## CHILE

Chile operated a bimetallic standard during 1870–78. Following financial crisis in 1878 and the War of the Pacific (1879) the country moved to an inconvertible currency. Convertibility was re-introduced in 1895 but ended abruptly in 1898.<sup>12</sup> For the period 1878–1913 two NEER indices were calculated as the weighted average for Chile's 6 main trading partners<sup>13</sup> (Argentina, Belgium, Britain, France, Germany, and the United States) using weights for 1880 and 1913 respectively. A geometric mean was then used to derive the Fisher ideal index over this period. The domestic price index for Chile is wholesale-based but with a composition skewed towards non-tradable agricultural goods. We have used wholesale prices as the counterpart deflator for Chile's trading partners.

## GREECE

Although a number of attempts were made by the Greek government to establish exchange rate stability, it was only in 1910 that Greece joined the Gold standard.<sup>14</sup> In April 1867 Greece signed the Latin Monetary Union agreement, accepting bimetallism. The new system was due to be implemented from 1 January 1869 but revolution in Crete in 1868

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<sup>11</sup> Luis A.V. Catão, 1992, "A new wholesale price index for Brazil during the period 1870–1913", *Revista Brasileira de Economia*, 46 (4), pp. 519-33.

<sup>12</sup> Agustin Llona Rodriguez, 2000, "Chile During the Gold Standard: A Successful Paper Money Experience," in Aceña, Pablo M. and Jaime Reis (eds.), *Monetary Standards in the Periphery: Paper, Silver and Gold, 1854–1933*, London and New York, St Martin's Press.

<sup>13</sup> These 6 countries accounted for over two thirds of visible trade both in 1880 and 1913.

<sup>14</sup> Sophia Lazaretou, 2003, "Greek Monetary Economics in Retrospect: The Adventures of the Drachma", Bank of Greece Working Paper 2, April.

resulted in the suspension of convertibility. Wars with Turkey in the 1870s and 1880s and the collapse of the LMU resulted in a more permanent suspension of the convertibility of the drachma. From 1898 successive Greek governments implemented monetary restraint, appreciating the drachma, allowing Greece to join the gold standard in March 1910. NEER indices were calculated for seven of Greece's main trading partners (UK, France, Austria-Hungary, Russia, Germany, Italy and the USA)<sup>15</sup> which together accounted for over 75 percent of visible trade between 1890 and 1913 – the two selected base years given the limitations of available trade destination information for earlier years. The Fisher ideal REER index was calculated over the same set of trading partners using the GDP deflator for Greece and either GDP or CPI deflators (depending on availability) for the trading partners.

## ITALY

Italy sustained the gold standard for only a few years over the period 1861–1913, being on gold over the period 1861–66 and for a short period in 1883.<sup>16</sup> Despite this, the Italian monetary authorities seem to have been particularly skillful in shadowing the gold standard over much of the period. For the period 1870–1913 the nominal effective exchange rate is calculated as the weighted average for Italy's 7 main trading partners (Argentina, Austria-Hungary, Britain, France, Germany, Switzerland and the United States), which together accounted for over 75% of Italy's trade during the period 1870–1913. Nominal effective exchange rate indices were constructed using bilateral trade weights for 1875 and 1905 respectively. A geometric mean was then used to derive the Fisher ideal index over this period. The Real effective exchange rate index has been calculated as weighted averages of nominal bilateral rates adjusted for relative consumer prices.

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<sup>15</sup> Turkey had to be excluded because no price information was available and we wanted comparability between the country coverage of the NEER and the REER.

<sup>16</sup> Giuseppe Tattara and Mario Volpe, 1997, "Italy, The Fiscal-Dominance Model, and The Gold-Standard Age," in Marcuzzo, Maria C., Officer, Lawrence H. and Rosselli, Annalisa. (eds.), *Monetary Standards and Exchange Rates*, New York and London.

## PORTUGAL

Portugal adopted the gold standard in 1854 and remained on gold until convertibility was suspended in 1891 and not resumed until 1930.<sup>17</sup> For the period 1870–1913 NEER indices were calculated as the weighted average for Portugal's 11 main trading partners using trade weights for 1870 and 1913 respectively.<sup>18</sup> A geometric mean was then used to derive the Fisher ideal index over this period. Using consumer price data for Portugal and its main trading partners we were able to produce a real effective exchange rate for the period 1870–1913 using the same weights as for the NEER.

## RUSSIA

Russia joined the gold standard in 1897<sup>19</sup> having been on a silver standard during 1870–76 and a paper currency during 1877–96.<sup>20</sup> NEERs have been calculated using bilateral trade weights for 12 of Russia's main trading partners (UK, France, Belgium, Italy, Germany, Netherlands, Denmark, Switzerland, Austria-Hungary, Japan, China and Spain) and trade weights for 1880 and 1913 respectively. A geometric mean was then used to derive the Fisher ideal index over this period. The REER index has been calculated as a weighted average of nominal bilateral rates adjusted for relative price changes. The trade weights and country coverage are the same as for the nominal rate. The

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<sup>17</sup> See M. Eugenia Mata and Nuno Valério, 1996, 'Monetary Stability, Fiscal Discipline and Economic Performance—The Experience of Portugal since 1854', in Jorge Braga de Macedo, Barry Eichengreen and Jaime Reis, *Currency Convertibility. The Gold Standard and Beyond*, 1996, London and New York, Routledge, pp. 208–9.

<sup>18</sup> The countries covered are Belgium, Brazil, France, Germany, Italy, Netherlands, Russia, Spain, Sweden, UK and USA. These countries accounted for 94 per cent of Portugal's trade in 1870 and 67 percent in 1913.

<sup>19</sup> Although the Russian credit ruble was trading at a fixed rate to the gold ruble by 1895; see Paul R. Gregory, 1994, *Before Command: An Economic History of Russia From Emancipation to the first Five-Year Plan*, Princeton, Princeton University Press, p. 59.

<sup>20</sup> Christopher M. Meissner, 2002. "A New World Order: Explaining the Emergence of the Classical Gold Standard," NBER Working Paper 9233.

calculation of the REER is based on consumer price deflators after 1885 (with the exception of China where we used wholesale prices). Before 1885 we used the St Petersburg wholesale price data.

## **SPAIN**

When the Peseta was created in 1868, Spain informally joined the Latin Monetary Union (in that Spain did not formally sign the Union's Treaty), with the gold and silver content of the Peseta equivalent to the French Franc. In 1878 when the Latin Monetary Union adopted the gold standard, Spain decided to remain on silver. In 1883, fearing an attack on its reserves, the Bank of Spain abandoned convertibility. Although there were plans to adopt the gold standard in 1906 and again in 1912 these failed. Nominal Effective exchange rates have been calculated using bilateral trade weights for 8 of Spain's main trading partners (Argentina, France, Germany, Italy, Mexico, Portugal, UK, and USA). Exchange rate indices were constructed using trade weights for 1870-4 and 1910-13 respectively.<sup>21</sup> A geometric mean was then used to derive the Fisher ideal index over this period. REER indices have been calculated as weighted averages of nominal bilateral rates adjusted for relative consumer prices.

## **The Gold Standard Core**

## **FRANCE**

France's NEER indices were calculated as weighted average of 17 of its main trading partners covering 75 percent of French merchandise trade over the 1870-1913 period.<sup>22</sup> Effective exchange rate indices were computed using trade weights for 1879 and 1913 respectively. As with all the other indices described in this Appendix, a geometric mean between the two series was used to derive the Fisher index. Given the large discrepancies in the available GDP deflators (see Appendix B) for France we decided to use the CPI index as a deflator.

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<sup>21</sup> The trade coverage in 1870-4 and 1910-13 was 78.7 per cent and 61.1 per cent respectively.

<sup>22</sup> The countries included are Argentina, Austria-Hungary, Belgium, Brazil, Chile, China, Germany, India, Italy, Netherlands, Norway, Portugal, Russia, Spain, Sweden, the UK and the US. One other significant trading partner was Algeria, the inclusion of which would increase the index coverage to over 80 percent. We have chosen to leave Algeria out of the NEER calculations because of the dearth of domestic price data would detract from comparability with the REER index.



## **GERMANY**

The German NEER series is calculated as the weighted average for 21 of its main trading partners, covering 77 per cent of German merchandise trade in 1880 and to 88 percent in 1913.<sup>23</sup> Effective exchange rate indices were constructed using trade weights for 1880 and 1913 respectively. A REER index was constructed using GDP deflators where possible.

## **UNITED KINGDOM**

The UK NEER index is calculated as the weighted average of 22 of its main trading partners accounting for approximately 78 percent of British visible trade (excluding re-exports) both in 1879 and 1913.<sup>24</sup> Effective exchange rate indices were constructed using 1879 and 1913 weights, respectively. A REER index was constructed using GDP deflators where possible.

## **UNITED STATES**

The US NEER series was constructed as a weighted average of 19 of its main trading partners, covering 81 percent of US visible trade (excluding re-exports) in 1879 and 1913. Effective exchange rate indices were constructed using 1879 and 1913 weights, respectively.<sup>25</sup> A REER index was constructed using GDP deflators where possible.

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<sup>23</sup> The countries included are Argentina, Australia, Austria-Hungary, Belgium, Brazil, Canada, China, Denmark, France, India, Italy, Japan, Netherlands, Norway, Portugal, Russia, Spain, Sweden, Switzerland, the UK and the US. Many of the smaller countries left out of the calculations were British and French colonies on gold, so it is highly unlikely that any biases would arise in leaving these countries out.

<sup>24</sup> These countries are: Argentina, Australia, Austria-Hungary, Belgium, Brazil, Canada, Chile, China, Denmark, France, Germany, Greece, India, Italy, Japan, Netherlands, Norway, Portugal, Russia, Spain, Sweden and the US.

<sup>25</sup> The countries included are Argentina, Australia, Belgium, Brazil, Canada, Chile, China, Denmark, France, Germany, India, Italy, Japan, Mexico, Netherlands, Portugal, Russia, Spain and the UK.

## APPENDIX B: DATA SOURCES

### Silver Standard Countries

#### CHINA

Trade weights: Trade Weights have been calculated using data from Yu-Kwei Cheng, 1956, *Foreign Trade and Industrial Development of China: An Historical and Integrated Analysis through 1948*, Washington, University Press of Washington D.C.

Wholesale Price Index: The deflator for wholesale prices in China is taken from Ho, F. L., 1927, 'Prices and price indexes in China', *Chinese Economic Journal*, I, 5, pp. 429-463. Ho used C.Y. Tang's index numbers of wholesale prices in China reported in *Science*, October 1926, a publication of the Science Society in China. The commodities included in the wholesale price index are largely tradable goods and include: brick tea, black tea, green tea, cocoons, sandal-wood, raw cotton, ginseng, paper, bird nest, tobacco, rice, wool, English yarn, tinned plates, lead, steel, iron, rattan, refined sugar, white sugar raw silk, woolen piece goods, coal, tin in slabs, indigo, straw braid, matches and hides. These are weighted by 1913 base year quantities of exports or imports.

Nominal Exchange rate: 1870-1899 the Pound rate is from Jurgen Schneider, Oskar Schwarzer and Friedrich Zellfelder, 1991, *Währungen der Welt*, Stuttgart: Franz Steiner Verlag. For the period 1900-1913 the Yen rate is reported in Japan Statistical association, 1988, *Historical Statistics of Japan*, Volume 3, pp. 104-7. The Pound-Yen rate (also reported in the same source) is used to generate a cross rate with the Pound.

Foreign Trade: Cheng, Yu-Kwei, *ibid*, pp. 258-59.

Terms of Trade: Cheng, Yu-Kwei, *ibid*.

Real GDP: N/A

#### INDIA

Trade Weights: Trade Weights have been calculated from: Brian R. Mitchell, 1995, *International Historical Statistics: Africa, Asia & Oceania 1750–1988*, New York, Macmillan.

Consumer Price Index: Raymond W. Goldsmith, 1983, *The Financial Development of India, 1860–1977*, New Haven, Yale University Press. Goldsmith provides no information on the composition of the index, but the data availability from Indian sources (from which the index was in likelihood derived) indicates that it is based on 100 commodities whose prices are mostly measured as wholesale quotations but also including some retail-level measures and weighted on the basis of information on the average consumption basket (see India, Department of Commercial Intelligence and Statistics, 1933, *Index Numbers of Indian Prices, 1861-1931*, Delhi).

Nominal Exchange Rate: India, Department of Commercial Intelligence and Statistics, 1933, *Ibid*, p. 18.

Foreign Trade: Dharma Kumar and Meghnad Desai, 1983, *The Cambridge Economic History of India*, Cambridge, Cambridge University Press, pp. 903–4.

Terms of Trade: Kumar D. and M. Desai, 1983, *ibid*, pp. 903-4.

Real GDP: *N/A*

## **JAPAN**

Trade Weights: Japan Statistical Association, 1988, *Historical Statistics of Japan*, Tokyo. Ippei Yamazawa and Y. Yamamoto, 1979, *Foreign Trade and Balance of Payments, Estimates of Long-Term Economic Statistics of Japan since 1868*, Vol. 14, Toyo Keizai Shinposha, Tokyo (in Japanese). Toyo Keizai Shinposha, 1935, *Foreign Trade of Japan: A Statistical Survey*.

Consumer and Wholesale Price Indices: LTES [*Estimates of Long-Term Economic Statistics of Japan*] edited by Kazushi Ohkawa, Miyoei Shinohara, and Mataji Umemura, Tokyo: Toyo Keizai Shinposha, Volume 8. The CPI index is made up of 30 commodities during 1879-92, comprising both tradable and non-tradable items as follows: i) Food (polished rice, polished barley, salmon, cod, soy-beans, adzuki beans, cow's milk, hen's eggs, dried bonito, sliced tangle, soy sauce, salt, bean paste, sake, tea); ii) Clothing (ginned cotton, cotton cloth, cotton shirting, hemp cloth, and sewing costs); iii) Fuel & Light (charcoal, fuel-wood, kerosene); iv) Housing (rent, daily wage of craftsman, water fee); v) Miscellaneous (public bath fee, newspapers, national railway fare and Japanese writing paper). After 1893 the CPI index is made up of 42 commodities consisting of the following categories: i) Food (polished rice, wheat flour, sardines, bonito, beef, cow's milk, hen's eggs, soy-beans, adzuki

beans, dried fish, bean curd, pickled radish, soy sauce, sugar, bean paste, salt, cakes, sake, beer, tea; ii) Clothing (bleached cotton cloth, cotton shirting, cotton wadding, silk wadding, silk lining, silk cloth, cotton thread, silk thread); iii) Fuel & Light (charcoal, fuel-wood, electricity, kerosene); iv) Housing (rent, daily wage of craftsman, water fee); iv) Miscellaneous (soap, public bath fee, hair cut fee, Japanese writing paper, national railway fee, newspaper, cigarettes).

Nominal Exchange Rate: For 1870-73 the bilateral pound-Yen rate between Yokohama and London was used, based on the cross-rates with the Mexican silver dollar (which was adopted by Japan in 1868). This is derived from Jurgen Schneider, Oskar Schwarzer and Friedrich Zellfelder, *Währungen der Welt IV. Asiatische und australische Devisenkurse im 19. Jahrhundert*, Stuttgart: Franz Steiner Verlag, 1991, pp.170 and 207. For 1874-1913 the bilateral Sterling-Yen rate can be found in Japan Statistical Association, 1988, *Historical Statistics of Japan*, Tokyo, pp. 104-7. The rate is calculated as the average of the highest and the lowest rate of the year. The US dollar-yen rate is also reported in the same source. For 1894 this source was not used because the highest and the lowest dollar-yen rates were remarkably different, suggesting a reporting error in the data. For this year an annual exchange rate was calculated as an arithmetic average of 12 monthly observations using data from the Ministry of Finance.

Foreign Trade: Masao Baba and Masashiro Tatemoto, "Foreign Trade and Economic Growth in Japan, 1858–1937", in Lawrence Klein and Kazushi Ohkawa, 1968, *Economic Growth: the Japanese Experience Since the Meiji Era*, Ontario, Illinois and Irwin-Drsey Ltd, ,p. 167 and p. 176.

Terms of Trade: Masao Baba and Masashiro Tatemoto, (1968), *ibid*.

Real GDP: Maddison, A., 1991, *Dynamic Forces in Capitalist Development*, Oxford, Oxford University Press, Appendix A.

## **MEXICO**

Trade Weights: Trade Weights have been calculated based on data from Colégio de México, 1960, *Estadísticas Económicas del Porfiriato: Comercio Exterior de México, 1877–1911*, Mexico.

Consumer Price Index: 1886-1913 from Aurora Gómez-Galvarriato and Aldo Musacchio, 2000, "Un nuevo índice de precios para México, 1886–1930", *Trimestre Económico*, 265, January–March, spliced with the index provided in Jeffrey G. Williamson, 1995, 'The Evolution of Global

Labor Markets Since 1830', *Explorations in Economic History*, 32(2), 1995, pp. 141-96, for the period 1877-85. For the period 1886-1913 the index is based on the quotation of close to thirty commodities comprising mostly textiles and foodstuffs, some of which are deemed to be non-tradable goods.

Nominal Exchange Rate: Instituto Nacional de Estadística, Geografía, e Informática, 1986, *Estadísticas Históricas de México*, Vols. 1 & 2, Mexico, INEGI.

Foreign Trade: Luis A.V. Catão, 1998, "Mexico and Export-Led Growth: the Porfirian Era Revisited", *Cambridge Journal of Economics*, 22 (1), January, pp. 59-78.

Real GDP: Solís, Leopoldo, 1985, *La Realidad Económica Mexicana: Retrovisión y Perspectivas*, Mexico, Siglo Vinteuno.

## **Paper Standard Countries**

### **ARGENTINA**

Trade Weights: Weights based on 'official values' calculated from Argentina's trade data using Brian R. Mitchell, (1993), *International Historical Statistics: The Americas 1750–1988*, Second Edition, New York, Macmillan. Trade Weights based on market values have been calculated from the national trade data of Brazil, France, Germany, UK and the USA. The data has been converted to a common currency using market exchange rates.

Exchange rate: For the period 1870-1883, the rate of paper peso per gold peso was taken from Gerardo della Paolera and Alan Taylor (eds.), 2003, *A New Economic History of Argentina*, Cambridge, Chapter 13, variable "APFA", which is reported in terms of paper pesos preceding the monetary reform of 1882; this was then converted to post-1882 paper pesos at the rate of 1 new paper peso= 4 old paper peso. For 1884-1900, annual paper peso-gold peso quotations from Alec G. Ford (1962, p. 142), *The Gold Standard 1880–1914: Britain and Argentina*, Oxford; identical data but covering the period 1884-1913 was obtained from the database underlying Gerardo della Paolera and Alan M. Taylor, 2001, *Straining at the Anchor: The Argentine Currency Board and the Search for Macroeconomic Stability, 1880–1935*, NBER, Chicago, which was kindly furnished to us by Alan

Taylor. The gold peso exchange rate was fixed throughout at the parity 1£ = 5.04 gold pesos. See Gerardo della Paolera and Alan M. Taylor, 2001, op.cit, p. 23 and pp. 46-48.

Foreign Trade: Gerardo della Paolera, 'Monetary and Banking Experiments in Argentina: 1861-1930', Paper presented at the conference, 'Economic Growth in the Long Run: Argentina, Brazil and Mexico, 1870-1950' at the Institute of Latin American Studies, University of London, March, 1992, pp. 3, 29, 42; and Alec G. Ford, op. cit, p. 195. Both sources express the series in gold pesos. This was then transformed into the current pound equivalent using the parity 1£ = 5.04 gold pesos (see above).

Terms of Trade: For the period 1870-1883 this index was calculated by dividing the export price index in Hector Dieguez, 1972, "Crecimiento e Inestabilidad del Valor y el Volume Fisico de las Exportaciones Argentina en el Periodo 1864-1963", *Desarrollo Economico*, Vol. 46, pp. 333-349, Table 18, p. 349, by the British wholesale price index in Brian R. Mitchell, 1988, *British Historical Statistics*, Cambridge, Cambridge University Press. For the period 1884-1913 the series was spliced with the estimates underlying della Paolera, G. and A. M. Taylor, 2001, *ibid*, which were kindly furnished by the authors.

Consumer Prices: Jeffrey G. Williamson, 1995, "The Evolution of Global Labor Markets Since 1830", *Explorations in Economic History*, 32 (2), pp. 141-96. Roberto Cortés-Conde, "Trends in Real Wages in Argentina (1880–1910)," Working Paper 26, Centre of Latin American Studies, University of Cambridge, 1976. The data is also reported in Cortés-Conde, *El Progreso Argentino, 1880-1914*, Buenos Aires, Sudamericana, 1979. Since the two sources yield virtually the same figures for the period 1890-1913 but very disparate estimates for the 1882-1889 years, and since unpublished data from Cortés-Conde is quoted as the ultimate data source for those years by Williamson, we opted to use the Cortés-Conde (1976, 1979) series for the period after 1882, using the Cortés-Conde foodstuff price index to interpolate the missing observations in his CPI series. No breakdown of the commodity composition of the index is provided.

## **BRAZIL**

Trade Weights: Computed from the national trade data of Argentina, France, Germany, UK and the USA. The data is based on market values and has been converted to a common currency using market exchange rates.

Price Deflator: Luis A.V. Catão, 1992, "A new wholesale price index for Brazil during the period 1870–1913", *Revista Brasileira de Economia*, 46 (4), pp. 519-33. While based on semi-wholesale quotations from a main commercial newspaper in Rio de Janeiro at the time, the underlying methodology used to construct this price index is based on aggregate output weights derived from the 1907 and 1919 national production censuses. As such the index can be regarded as close to a GDP deflator. It comprises 35 goods, with large weights attributed to foodstuffs and textiles, but also including intermediate goods and imported capital goods. The high weights for textiles and other largely imported goods make the composition of the index somewhat biased towards tradable goods.

Nominal exchange Rate: Instituto Brasileiro de Geografia e Estatística, 1987. *Estatísticas Históricas do Brasil*, Rio de Janeiro, IBGE, pp. 545-49. The monthly quotations of the pence/mil-réis exchange rate reported in this source were converted to annual frequency by arithmetic averaging.

Foreign Trade: Instituto Brasileiro de Geografia e Estatística, 1987, *ibid*, pp. 523-24. For the period 1870-1887, official trade figures reported on a fiscal year basis, which we then converted into a calendar year equivalent by simple averaging adjacent observations.

Terms of Trade: Instituto Brasileiro de Geografia e Estatística, 1987, *ibid*, pp. 551-52.

Gross Domestic Product: 1870-1900 from Claudio Contador and Claudio Haddad, 1975, *Produto Real, Moeda and Preços: A Experiência Brasileira no Período 1861-1970*,” *Revista Brasileira de Estatística*, jul./set. pp. 407-440; 1900-1913 from Haddad, C. 1978, *O Crescimento do Produto Real Brasileiro*, 1900-47, Rio de Janeiro.

## CHILE

Trade Weights: A limited set of trade weights was calculated using Brian R. Mitchell, (1993), *International Historical Statistics: The Americas 1750–1988*, Second Edition, New York, Macmillan.

Weights for six countries were calculated using the trade data of Katherine Barbieri, 1996, *Economic Interdependence and Militarized Interstate Conflict, 1870–1985*, Ph.D. Dissertation, Binghamton University, Binghamton, NY. and Katherine Barbieri, 1998, “Trade and Conflict: Assessing the Impact of Interdependence on Militarized Conflict,” Unpublished manuscript. The data has been posted at [http://pss.la.psu.edu/TRD\\_DATA.htm](http://pss.la.psu.edu/TRD_DATA.htm)

Wholesale Prices: Chilean prices are based on urban wholesale index comprising consumer goods (largely foodstuff items) and at least one intermediate input (coal), as reported in Juan Braun, Matías Braun, Ignacio Briones, José Díaz, Rolf Luders and Gert Wagner, 2000, "Economía Chilena 1810–1995: Estadísticas Históricas", Documento de Trabajo No. 187, Catholic University of Chile, Instituto de Economía.

Exchange rate: The peso-sterling rate for the period 1870–1913 is reported in J. Braun, M. Braun, I. Briones, J. Díaz, R. Luders and G. Wagner, 2000, *ibid.*

Foreign Trade: J. Braun, M. Braun, I Briones, J. Díaz, R. Luders and G. Wagner, 2000, *ibid.*

Terms of Trade: J. Braun, M. Braun, I Briones, J. Díaz, R. Luders and G. Wagner, 2000, *ibid.*

Real GDP: J. Braun, M. Braun, I Briones, J. Díaz, R. Luders and G. Wagner, 2000, *ibid.*

## **GREECE**

Trade Weights: Brian R. Mitchell, 1992, *International Historical Statistics: Europe 1750-1988*. London, Macmillan.

Nominal exchange rate: During 1870-1913 the Pound-Drachma rate is reported in Dertiles, G. B., 1993, *Productive or Unproductive? Taxes and Power in the Modern Hellenic State*, Table t-4, p. 128, Athens. The French Franc-Drachma rate is reported in Sophia Lazaretou, “Government Spending, Monetary Policies and Exchange Rate Regime Switches: The Drachma in the Gold Standard Period”, *Explorations in Economic History*, 35, pp. 28-50.

GDP Deflator: Kostelenos, G., S. Petmezas, D. Vasileiou, E. Kounaris, M. Sfakianakis, (Forthcoming), *Gross Domestic Product 1830-1939, Sources of Economic History of Modern Greece*,



*Quantitative Data and Statistical Series 1830-1939*, Historical Archives of the National Bank of Greece, Athens.

Foreign Trade: Brian R. Mitchell, 1992, op.cit.

Terms of Trade: Constructed from original sources by Jeffrey G. Williamson and Yael S. Hadass, 2003, “Terms-of-Trade Shocks and Economic Performance, 1870-1940: Prebisch and Singer Revisited”, *Economic Development and Cultural Change*, 51 (3), pp. 629-56.

Real GDP: Kostelenos, G., S. Petmezas, D. Vasileiou, E. Kounaris, M. Sfakianakis, *ibid*.

## ITALY

Trade Weights: Derived from Istituto Centrale di Statistics, 1958, *Sommanio di Statistiche Storiche Italiane, 1861–1955*, Rome.

Exchange rate: Pierluigi Ciocca and Adalberto Ulizzi, 1990, “I Tassi di Cambio Nominalli e ‘reali’ dell'Italia”, in *Ricerche Per la Storia della Banca d'Italia*, Rome, Latarza, pp. 354–5.

Consumer prices: Angus Maddison, 1991, *Dynamic Forces in Capitalist Development*, Oxford, Oxford University Press, Appendix E.

Foreign Trade: Value figures in Liras from Mitchell, B.R. 1992, *International Historical Statistics: Europe 1750-1988*, Macmillan.

Terms of Trade: For 1870-1890, an export volume index is provided in Maddison, op. cit., Table F2, pp. 314-15. An import volume index was constructed by deflating nominal imports by a weighted average of the wholesale price indices of France, Germany, and the United Kingdom, where the weights were the average weights of the three countries in Italy’s trade in 1875 and 1905. A terms of trade index for the period 1870-90 was then computed by dividing the nominal export to import ratio by the ratio of export to import volumes. For the post-1890 period, a terms of trade series is available from Nicola Rossi, Andrea Sorgato and Gianni Toniolo, 1992, “Italian Historical Statistics”, Working Paper 9218, Department of Economics, Universidad degli Studi de Venezia.

Real GDP: Maddison, A., op.cit, Appendix A.

## PORTUGAL

Trade Weights: A set of weights has been derived based on Lains, Pedro, 1995, *A Economia Portuguesa no Século XIX. Crescimento Económico e Comércio Externo*, Lisbon, Imprensa Nacional.

Exchange rate: M. Eugénia Mata and Nuno Valério, 1996, 'Monetary Stability, Fiscal Discipline and Economic Performance—The Experience of Portugal since 1854', in Jorge Braga de Macedo, Barry Eichengreen and Jaime Reis, *Currency Convertibility. The Gold Standard and Beyond*, London and New York, Routledge.

Consumer Prices: Ana B. Nunes, M. Eugénia Mata and Nuno Valério, 1989, 'Portuguese Economic Growth, 1833-1985', *Journal of European Economic History*, Vol. 18, 2, pp. 291-330 (Appendix 2). The price index reported in this work is based on the series provided in David Justino, *Preços e Salários em Portugal (1850-1912)*, Banco de Portugal, Lisbon. The index consists of 21 goods comprising foodstuffs, textiles, coal and firewood, with mostly wholesale price quotations (although some are based on retail information) reported in the books of various institutions in different regions of the country.

Foreign Trade: Pedro Lains, *A Economia Portuguesa no Século XIX. Crescimento Económico e Comércio Externo*, Lisbon, Imprensa Nacional, 1995. The figures used are based on the author's revision of the respective official series.

Terms of Trade: Obtained as a ratio of export and import values to export and import volumes obtained from the same source.

Real GDP: das Neves, João Luís César, 1994, *The Portuguese Economy: A Picture in Figures: XIX and XX Centuries with Long Term Series*, Lisbon, Universidade Católica Editora.

## RUSSIA

Trade Weights: Trade weights for Russia's six major trading partners can be calculated from Mitchell, B.R., 1992, *International Historical Statistics: Europe 1750-1988*, Macmillan, Basingstoke. A more extensive set of weights was derived using the trade data of Katherine Barbieri, 1996, *Economic Interdependence and Militarized Interstate Conflict, 1870-1985*, Ph.D. Dissertation.

Binghamton University, Binghamton, NY. and Katherine Barbieri, 1998, "Trade and Conflict: Assessing the Impact of Interdependence on Militarized Conflict," Unpublished manuscript. The data has been posted at [http://pss.la.psu.edu/TRD\\_DATA.htm](http://pss.la.psu.edu/TRD_DATA.htm).

Exchange rate: The pound rate has been derived from the foreign exchange section of 'The Bankers' Gazette', *The Economist*. An annual exchange rate was calculated as an arithmetic average of 12 monthly observations, sampling over the first/second week for each month.

Consumer Price Index: Paul R. Gregory, 1982, *Russian National Income, 1885–1913*, Cambridge, Cambridge University Press, Table A.1. The index covers 27 products but more disaggregated information on the composition of the index is not provided. A wholesale price index is reported for St Petersburg for the period 1870-1885- see Paul R. Gregory, 1994, *Before Command: An Economic History of Russia From Emancipation to the first Five-Year Plan*, Princeton, Princeton University Press.

Foreign Trade: Mitchell, B.R., 1992, op.cit.

Terms of Trade: Constructed from original sources by J. G. Williamson and Y. Hadass, 2003, "Terms-of-Trade Shocks and Economic Performance, 1870-1940: Prebisch and Singer Revisited", *Economic Development and Cultural Change*, 51 (3), pp. 629-56.

Real GDP: In the absence of a real GDP series, the net national product estimate provided in Gregory, P.R., 1982, Table 3.1, pp. 56-7, ("variant 1") was used.

## SPAIN

Trade weights: Calculated from Brian R. Mitchell (1998) and Antonio Tena (2004), 'El sector exterior', in A. Carreras and X. Tafunell (eds.), *Estadísticas Históricas de España. Siglos XIX y XX*, Madrid, Fundación Banco Exterior.

Consumer Prices: The deflator for private consumption is taken from Leandro Prados de la Escosura, 2003, *El Progreso Económico de España (1850-2000)*, Madrid, Fundación BBVA. The index comprises information from a number of sources, the main source being the Sardá price index reported in Carreras, A., 1989, op.cit. The Sarda index comprises a basket of 9 goods, which are mostly imported commodities.

Exchange rate: Spain's bilateral exchange rate with Sterling from Pablo M. Aceña and Jaime Reis, 2000, *Monetary Standards in the Periphery. Paper, Silver and Gold, 1854–1933*, London, Macmillan, pp. 145-7.

Foreign Trade: Prados de la Escosura, Leandro, *De imperio a nación. Crecimiento y atraso económico en España (1780-1930)*, 1988, Madrid, Alianza, pp. 257-9.

Terms of Trade: Prados de la Escosura, Leandro, 1988, *ibid.*

Real GDP: Prados de la Escosura, Leandro, 2003, *op.cit.*, Table A.13.5, pp. 681-82.

## **Core Gold Standard Countries**

### **FRANCE**

Trade weights: Derived using *Annuaire Statistique de la France* (1878–1913).

GDP deflator: Two GDP deflators are available for France. The first is derived as the ratio of current price GDP reported in Maurice Lévy-Leboyer and François Bourguignon, 1990, *The French Economy in the Nineteenth Century*, Cambridge, Cambridge University Press (Appendix A, table AIII) divided by real GDP from the output side weighted by 1913 sectoral shares. Although the deflator is not reported it can be calculated from the information given on output series and shares of production. A second series can be found in J. C. Toutain, *Le Produit intérieur de la France de 1789 à 1982*, Presses Universitaires de Grenoble, 1987. Over some years the two series differ significantly without any clear explanation from the authors.

Consumer prices: Angus Maddison, 1991, *Dynamic Forces in Capitalist Development*, Oxford, Oxford University Press, Appendix E.

Foreign Trade: Brian R. Mitchell, 1992, *International Historical Statistics: Europe 1750-1988*. London, Macmillan.

Terms of Trade: Maurice Lévy-Leboyer and François Bourguignon, *The French Economy in the Nineteenth Century*, Cambridge, Cambridge University Press, Table A VI.

Real GDP: Maddison, A., 1991, *Dynamic Forces in Capitalist Development*, Oxford, Oxford University Press, Appendix A.

## GERMANY

Trade Weights: Calculated from *Statistisches Jahrbuch für das Deutsche Reich* (1880–1913).

GDP deflator: Implicit GDP deflator derived by deflating current price income estimate of GDP with the output measure of real GDP based on 1913 production weights. The data is reported in Brian R. Mitchell, 1992, *International Historical Statistics: Europe 1750-1988*. London, Macmillan.

Consumer prices: Maddison, Angus, 1991, *Dynamic Forces in Capitalist Development*, Oxford, Oxford University Press, Appendix E.

Trade Volumes: Mitchell, B.R., 1992, *International Historical Statistics: Europe 1750-1988*. London.

Real NNP: Walther G. Hoffmann, 1965, *Wachstum der Deutschen Wirtschaft seit der Mitte des 19 Jahrhunderts*, Berlin, Springer-Verlag.

Terms of Trade: Walther G. Hoffmann, 1965, *ibid*, Table 134, col. 1, p. 548.

## UNITED KINGDOM

Trade weights: Calculated from *Annual Statement of the Trade of the UK* (1870–1913)

GDP Deflator: The GDP deflator is derived as the ratio of current and constant price expenditure estimates of GDP reported in Charles H. Feinstein, 1972: *National Income Expenditure and Output of the UK 1855-1965*, Cambridge, Cambridge University Press.

Consumer Prices: Charles H. Feinstein, 1991, 'A New Look at the Cost-of-Living, 1870-1914', in Foreman-Peck, James (ed.), *New Perspectives on the Late Victorian Economy: Essays in Quantitative Economic History 1860-1914*, Cambridge, Cambridge University Press, pp. 151-79.

Exchange Rate: The pound-dollar rate is from Lawrence H. Officer, "Exchange rate between the United States dollar and the British pound, 1791-2000: Source Notes" Economic History Services, EH.Net, 2001. URL: <http://www.eh.net/hmit/exchangerates/poundsource.html>

Foreign Trade: Brian R. Mitchell, 1988, *British Historical Statistics*, Cambridge, Cambridge University Press.

Terms of Trade: Charles H. Feinstein, 1972, *National Income Expenditure and Output of the UK 1855-1965*, Cambridge, Cambridge University Press, Table 64.

GDP/GNP Series: The compromise estimate of GDP and GNP is taken from Feinstein, 1972, *ibid.* The Balanced estimate of GDP is taken from Solomos N. Solomou, and Martin R. Weale, 1991: 'Balanced Estimates of United Kingdom GDP, 1870-1913', *Explorations in Economic History*, 28, pp. 54-63. Given the large discrepancy between GDP and GNP due to the UK's sizeable foreign income component, we also considered the GNP indicator in our foreign trade equation estimates which proved to yield a better fit, consistent with what one would expect from theory.<sup>26</sup>

## UNITED STATES

Trade weights: Calculated using *Annual Abstract of Statistics of the United States Commerce and Navigation of the United States*.

Exchange Rate: Lawrence H. Officer, 2001, "Exchange rate between the United States dollar and the British pound, 1791-2000: Source Notes" Economic History Services, EH.Net, URL: <http://www.eh.net/hmit/exchangerates/poundsource.html>

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<sup>26</sup> For a discussion see Robert E. Rowthorn and Solomos N. Solomou, 1991, 'The Macroeconomic Effects of Overseas Investment on the UK Balance of Trade, 1870-1913', *Economic History Review*, XLIV, 4, 654-64.

Consumer Prices: A revised index is reported in Mark Siegler and Stephen J. Perez "Inflationary Expectations and the Fisher Effect Prior to World War I, 2003," *Journal of Money, Credit, and Banking*, 35, 6, Part 1, pp. 947-965.

GDP Deflator: For the USA the GDP deflator is a hybrid measure as reported in Balke, Nathan S., and Robert J. Gordon, 1989, "The Estimation of Prewar Gross National Product: Methodology and New Evidence," *Journal of Political Economy*, 97, 38-92. They used consumer prices from three sources: Hoover, Ethel D., 1960, "Retail Prices after 1850," in *Trends in the American Economy in the Nineteenth Century*, Studies in Income and Wealth, Vol. 24, Princeton, Princeton University Press; Rees, Albert, 1961, *Real Wages in Manufacturing, 1890-1914*, Princeton, Princeton University Press; and an index of construction costs from Gottlieb, Manuel, 1965, "New Measures of Value of Nonfarm Building for the United States, Annually 1850-1939," *Review of Economics and Statistics*, 47, pp. 412-419.

Foreign Trade: Brian R. Mitchell, 1998, *International Historical Statistics: The Americas and Australasia*. London, Macmillan.

Terms of Trade: Jeffrey G. Williamson, 1964, *American Growth and the Balance of Payments 1820-1913*, Chapel Hill, North Carolina, University of North Carolina Press, Table B4, p. 262.

Real GNP: Matthew T. Jones and Maurice Obstfeld, 'Saving, investment, and Gold: A Reassessment of Historical Current Account Data, in Guillermo A. Calvo, Maurice Obstfeld and Rudiger Dornbusch (eds.), 2001, *Money, Capital Mobility and Trade: Essays in Honor of Robert A. Mundell*, MIT Press.

**Table A.1. The Gold Standard Core: Trade Structure**

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a. Per Cent of Trade with Other Core Countries				
	1875 <sup>1</sup>	1885	1895	1905
United Kingdom	33.3	34.0	34.9	30.7
France	40.1	35.8	38.3	39.0
Germany	n.a.	35.1	33.3	30.8
United States	59.3	57.9	53.6	44.6
b. Per Cent of Trade with Non-gold Periphery				
	1875	1885	1895	1905
United Kingdom	65.4	37.5	35.1	17.5
France	50.1	44.2	41.1	28.9
Germany	n.a.	47.8	42.0	18.0
United States	34.7	26.9	29.5	24.3
c. Per Cent of Trade as a Share of GDP				
	1875	1885	1895	1905
United Kingdom	47.7	49.4	47.6	49.0
France	28.6	30.9	27.6	28.9
Germany	n.a.	32.8	31.8	35.8
United States	13.2	13.8	12.7	11.9

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1/ While the United States did not join the gold standard until 1879, we also report 1875 figures for the US, both for the sake of symmetry and comparability with other countries and also because there were no dramatic changes between the respective shares for that year and those for 1879.









